# Attachment 10: Environmental Interactions Table

An environmental and socio-economic screening (review) was conducted for Imperial Oil Resources N.W.T. Limited's (Imperial) Line 490 Replacement Activities at Imperial's Norman Wells Operations (NWO). The Replacement Activities include construction of an approximately 1,050 m-long section of the Line 490 corridor under a channel of the Mackenzie River. The Line 490 corridor is comprised of four (4) flowlines and one (1) cable conduit. Replacement piping will be comprised of the following: NPS 10 emulsion line pipe; NPS 6 emulsion line pipe; NPS 6 water line pipe; NPS 4 natural gas line pipe; NPS 4 cable conduit. The Replacement Activities will be located within an existing right-of-way (ROW) and will employ trenchless watercourse crossing methods (i.e., horizontal directional drilling). The Replacement Activities are contemplated to include drilling a single drilling hole between Goose and Bear Island, approximately 24 to 30 inches in diameter. All four flowlines and the cable conduit will be bundled within one exterior casing. The channel of the Mackenzie River is approximately 600 m at the drill location. Depth of drilling is planned for at least 15 m below the lowest point of the riverbed. Once the crossing is completed, flowlines will be connected to the existing Line 490 flowlines and conduit approved under Imperial's Operating Authorization.

The Replacement Activities are located on private lands in the Norman Wells Proven Area and adjacent to Imperial's existing Norman Wells Operations (NWO) on the Mainland and Goose and Bear islands. The HDD drill path under the Mackenzie River is located in an existing ROW disposition held by Imperial on federal lands.

Construction equipment may include an excavator, hydrovac truck, crane, lowboy trailers, welding trucks, water truck, and crew vehicles. Mobilization of vehicles and equipment to Norman Wells will begin in Winter 2024-2025 along existing ice roads (as soon as ice road is available) and via barge as required. Access to the Replacement Activities in Summer 2025 will use a barge operated by Imperial; barge infrastructure at Norman Wells and Goose and Bear islands is existing.

Pending regulatory approval, construction of the Replacement Activities is expected to take place in Spring/Summer 2025 with commissioning to take place in Fall/Winter 2025, after which the Replacement Activities will be managed under Imperial's Operating Authorization for NWO.

Approximately 33-45 workers are required to complete the proposed construction activities. Imperial's existing camp on the mainland of Imperial's NWO is anticipated to house contractors during construction. No additional workers are required to operate the flowlines.

This environmental and socio-economic screening has been developed to support the submission to the CER. A disturbance footprint was defined for this screening. The disturbance footprint encompasses the anticipated area of physical disturbance associated with the construction of the Replacement Activities. The disturbance footprint is approximately 3.58 ha in area, including the entry side workspace on Bear Island (approximately 50 m by 70 m plus a 20 m x 100 m area along the existing road and right-of-way) and exit side workspace (approximately 50 m by 50 m) and HDD pullback (approximately 25 m by 1085 m) on Goose Island. Areas outside the HDD entry and exit sites (including all temporary workspace) will be matted during construction.

The following Interactions Table summarizes the environmental and socio-economic screening (review) that was developed for the Replacement Activities.

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| Physical and Meteorological Environment | N | • The Replacement Activities[1] are located in a discontinuous permafrost zone; however, permafrost is absent in the vicinity of the Mackenzie River. Permafrost is thus not anticipated to occur in the disturbance footprint.<br>• The Replacement Activities are not within areas of unstable terrain or acid rock drainage.<br>• The Replacement Activities will not affect the meteorological environment.<br>• Potential effects associated with erosion potential are discussed in the Soil and Soil Productivity element of this table.<br>• Potential effects associated with extreme weather events are discussed in the Effects of the Environment on the Project element of this table. | N/A | None | N | None | N/A | N/A | N/A |
| Soil and Soil Productivity | Y | • The Replacement Activities are located in the Taiga Plains Low Subarctic (LS) – North Mackenzie Plan LS Ecoregion, which is characterized by Brunisolic and Luvisolic soils on glacio fluvial, coarse-textured lacustrine, and alluvial soils parallel to the Mackenzie River (GNWT 2009).<br>• The Replacement Activities are located on Goose and Bear islands, which are natural islands in the Mackenzie River adjacent to Norman Wells. The islands are subject to seasonal flooding/ice scouring.<br>• The Replacement Activities are located on private lands in the Norman Wells Proven Area and adjacent to Imperial's existing NWO on the Mainland and Goose and Bear islands.<br>• The disturbance footprint[2] is approximately 3.58 hectares (ha) in area, including the entry side workspace on Bear Island and exit side workspace and HDD pullback on Goose Island. Of this, 1.81 ha occurs within previously disturbed areas used for Imperial's existing NWO and 1.77 ha is native vegetation. No new permanent disturbance is required.<br>• Mobilization of vehicles and equipment to Norman Wells will occur in winter 2024-2025 along existing ice roads and existing barges in the summer months. Access to the disturbance footprint will occur in summer 2025 using a barge operated by Imperial; barge infrastructure at Norman Wells and Goose and Bear islands is existing. As a result, no disturbance to soil is predicted during access to the site. | Complete | Change in soil quality during construction due to:<br>• Loss or alteration (e.g., admixing) of topsoil/strippings during soil handling and storage<br>• Compaction, rutting, admixing or loss of soil structure through vehicle and equipment movement<br>• Soil loss through wind and water erosion following vegetation clearing<br>• Disturbance of pre-existing soil contamination (if present) | Y | • Conduct pre-disturbance assessments to identify environmental features in and adjacent to the disturbance footprint prior to commencement of construction.<br>• Clearing should be done during dry conditions to the extent practicable to limit disturbance to soil and vegetation.<br>• Soil disturbance including grubbing will occur only within the approved clearing limits.<br>• Minimize soil stripping and grading to the extent possible.<br>• Stockpile topsoil and subsoil separately with adequate spacing between piles. If space is limited, maintain separation between soil piles using appropriate barriers.<br>• Where contamination is known or suspected to occur, stockpile those materials separately.<br>• Do not push or store graded or stripped material in treed areas.<br>• Topsoil may be stockpiled on undisturbed topsoil within approved clearing limits.<br>• Subsoil must be stockpiled on areas where topsoil has been removed. | Change in soil quality may occur:<br>• Soil loss or alteration may occur during construction as a result of soil handling, admixing, compaction, rutting, and erosion.<br>• Following construction, the footprint (approximately 3.58 ha) will be reclaimed, including regrading and replacement of any disturbed soils.<br>• The probability of encountering pre-existing contamination is moderate. If contamination is encountered, Imperial will manage it according to the EPP.<br><br>After the implementation of mitigation measures, minimal adverse residual effects of construction of the Replacement Activities on soil and soil productivity are anticipated to occur. Effects | The contribution of the Replacement Activities to existing cumulative effects on soils is considered negligible at the regional scale. Residual effects on soil quality will be confined to the disturbance footprint for the duration of construction. Post-construction reclamation will be completed such that equivalent land capability will be achieved. As a result, assessment of cumulative effects on soils is not warranted. | Monitoring and inspection will occur during construction and in the post-construction phase. |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

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| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| | | • Limited excavation and grading is required for Horizontal Directional Drilling (HDD) flowline replacement and tie-in to existing flowlines in the Line 490 corridor. Areas outside the HDD entry and exit sites (including all temporary workspace) will be matted during construction. As a result, no disturbance to soil is predicted outside the HDD entry and exit sites.<br>• There is potential to encounter existing contamination at the site as the existing flowlines carry natural gas and emulsion (i.e., oil, water, gas) and the existing Norman Wells Operation is adjacent to the disturbance footprint.<br>**Interactions**<br>Interactions with soil and soil productivity may occur during construction due to:<br>• vegetation clearing<br>• soil stripping and grading<br>• excavation<br>• vehicle and equipment movement<br>• pre-existing soil contamination (if discovered) | | | | • Clearly label soil stockpiles as “topsoil” and “subsoil” as appropriate to prevent inadvertent admixing or improper backfilling.<br>• Salvage topsoil to the colour change (transition layer), bottom of the duff layer or 15 cm, whichever is deepest. Where there is little or no topsoil, salvage all available root zone material to the colour change or 15 cm, whichever is greater.<br>• Where topsoil depth is not distinguishable by colour, consult the Environmental Inspector for guidance on topsoil stripping.<br>• Where construction during adverse weather conditions have the potential to result in wind/water erosion, excessive rutting, decreased soil capability or the potential for serious harm to fish and fish habitat, temporary shutdowns may be necessary. Temporary shutdowns will be based upon discussions between the Construction Manager, Contractor and Imperial Environment and Regulatory Advisor or Environmental Inspector. The Construction Manager must authorize resumption of work in consultation with the Imperial Environment and Regulatory Advisor or the Environmental Inspector prior to restart.<br>• Prior to construction, where there is potential for soil erosion, the need for and location of ESC measures should be determined by the Environmental Inspector and installed prior to the commencement of work in the area.<br>• Conduct ground disturbance activities in a manner to avoid or reduce erosion and the discharge of sediment-laden runoff from directly entering natural drainage systems.<br>• Manage the potential for off-site migration of sediment through the installation of ESC measures (e.g., | will be limited to the disturbance footprint and for the duration of construction (approximately 5 months). Post-construction reclamation activities will be undertaken following construction.<br><br>Residual effects are predicted to be not significant. | | |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
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| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| | | | | | | coir logs, erosion control matting, sediment fence) as identified by the Environmental Inspector.<br>• The Environmental Inspector will monitor soil stockpiles for erosion by wind. In the event of wind erosion, implement the following mitigation measures as warranted:<br>  ○ suspend construction activities until high winds subside<br>  ○ apply water to the topsoil pile<br>  ○ lightly compact sandy or pulverized soils<br>  ○ install wind fences<br>• ESC and stabilization measures should be maintained and monitored during and following the Replacement Activities until vegetative cover is established. Where evidence of erosion is identified, corrective control measures should be implemented as soon as conditions permit.<br>• ESC and stabilization measures should be maintained and monitored during and following the Replacement Activities until vegetative cover is established. Where evidence of erosion is identified, corrective control measures should be implemented as soon as conditions permit.<br>• Prepare the site in such a manner as to facilitate reestablishment of natural vegetation. Revegetation by natural recovery is anticipated. This will be evaluated during post-construction environmental monitoring.<br>• Reclamation activities will be planned to align with the Norman Wells Interim Closure and Reclamation Plan (AMEC Foster Wheeler 2016).<br>• Remove matting, geotextiles and ramps, if used, except where access | | | |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| | | | | | | may be required for cleanup activities.<br>• Recontour graded areas to restore preconstruction grade and drainage. Where restoration of preconstruction grade is not feasible, recontour to grades not exceeding 1:3 or as directed by a geotechnical engineer.<br>• Replace topsoil as evenly as possible over areas where topsoil was salvaged. Postpone topsoil replacement during wet weather or high winds to limit potential damage to soil structure or erosion of topsoil.<br>• Conduct post-construction environmental monitoring following completion of construction activities. Undertake site visits in the spring and late summer and document any of the following:<br>  ○ Erosion, subsidence or soil slumping<br>  ○ Ponding water<br>  ○ Vegetation conditions<br>  ○ Debris or waste materials<br>• If potentially contaminated soils are encountered during construction, the Contractor should suspend work in the vicinity of the potentially contaminated soil and immediately notify the Imperial Environment and Regulatory Advisor and Environmental Inspector to determine an appropriate plan of action. Work should not resume until a plan to manage the potentially contaminated soil has been developed. | | | |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| Vegetation | Y | • The Replacement Activities are located in the Taiga Plains Low Subarctic (LS) – North Mackenzie Plan LS Ecoregion, which is characterized by mixed coniferous forest and shrubland (GNWT 2009)<br>• The Replacement Activities are located on Goose and Bear islands, which are natural islands in the Mackenzie River adjacent to Norman Wells. The islands are subject to seasonal flooding/ice scouring.<br>• The Replacement Activities are located on private lands in the Norman Wells Proven Area and adjacent to Imperial's existing NWO on the Mainland and Goose and Bear islands.<br>• The Replacement Activities are approximately 3.58 ha in area, including the entry side workspace on Bear Island and exit side workspace and HDD pullback on Goose Island. Of this, 1.81 ha occurs within previously disturbed areas used for Imperial's existing NWO and 1.77 ha is native vegetation. No new permanent disturbance is required.<br>o Vegetation within previously disturbed areas (i.e., vegetated right-of-way; 1.30 ha) is comprised of early seral stage communities (i.e., shrub, grass and forb-dominated).<br>o Native vegetation is comprised of early seral stage communities (i.e., shrub). Vegetation in these areas (1.77 ha) may be previously undisturbed or may be regenerating shrubland that is undergoing succession towards forest communities.<br>• There are 136 vascular, 31 lichen, and 1 moss species of conservation concern (SOCC) with the potential to occur within the Taiga Plains LS ecoregion.<br>o Of the 136 vascular SOCC, 65 are listed as *may be at risk* and 71 are listed as *sensitive* under NWT General Species Rankings. Yukon aster (*Symphyotrichum yukonense*) and Tyrrell's willow (*Salix tyrrellii*) are on the *Species at Risk Act* (SARA) registry but were downgraded to *not at risk* in 1996 and 1999 (GOC 2023). Both species are still listed as *may be at risk* under NWT General Species Rankings (GNWT 2024).<br>o Of the 30 lichen SOCC, 4 are listed as *may be at risk* and 27 are listed as *sensitive* under NWT General Species Rankings (GNWT 2024). No lichen SOCC are listed under COSEWIC (GOC 2023). | Complete | Change in vegetation communities and species during construction due to:<br>• Direct loss or alteration of native vegetation communities and plant SOCC arising from vegetation clearing and ground disturbance.<br>• Alteration of vegetation communities arising from the introduction or spread of alien and invasive alien plant species through vehicle and equipment movement. | Y | • Conduct pre-disturbance assessments to identify environmental features in and adjacent to the disturbance footprint prior to commencement of construction.<br>• Clearing should be done during dry conditions to the extent practicable to limit disturbance to soil and vegetation.<br>• Clearing activities should be monitored by the Environmental Inspector to ensure clearing is limited to approved limits of clearing.<br>• Do not allow clearing or grubbing beyond the staked or flagged workspace boundaries.<br>• Prepare the site in such a manner as to facilitate reestablishment of natural vegetation. Revegetation by natural recovery is anticipated. This will be evaluated during post-construction environmental monitoring.<br>• Conduct post-construction environmental monitoring following completion of construction activities. Undertake site visits in the spring and late summer and document any of the following:<br>o Erosion, subsidence or soil slumping<br>o Ponding water<br>o Vegetation conditions<br>o Debris or waste materials<br>• Equipment will arrive at site clean and free of soil and vegetative debris. Any equipment which arrives in a dirty condition will not be allowed on site until it has been cleaned.<br>• Flag areas identified as having invasive or noxious weed infestations prior to the start of construction.<br>• Conduct basic shovel and sweep cleaning before moving equipment from any locations identified as having an invasive weed infestation. | Change in vegetation communities and species may occur:<br>• Up to 1.77 ha of shrubland and 1.30 ha of previously disturbed vegetation may be removed during construction, although the actual area of disturbance is expected to be less due to use of matting.<br>• Following construction, shrubland will be allowed to re-establish on the workspace. Where required during operations, on-going brushing and vegetation management will be completed to satisfy regulatory and operational requirements.<br>• Plant species having socio-economic or traditional importance could occur on the footprint. However, vegetation types anticipated to be present on the footprint are relatively common in the region; therefore, while there might be effects on such species, multiple other occurrences are likely present regionally.<br>• Weeds may be introduced or spread through vehicle or equipment movement. Mitigation measures to reduce the risk of introduction or spread of alien plant species will be applied.<br>After the implementation of mitigation measures, minimal adverse residual effects of | Past and present projects and physical activities have influenced the baseline conditions for vegetation in the region (e.g., oil and gas, transportation infrastructure).<br><br>Cumulative effects on vegetation communities and species are likely to occur as a result of ongoing disturbance that has been and continues to occur in the area as a result of industrial development. With the implementation of mitigation measures, the Replacement Activities are predicted to make a negligible contribution to ongoing cumulative effects on vegetation at the regional scale. | Monitoring and inspection will occur during construction and in the post-construction phase. |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| | | ○ The moss SOCC is listed as *sensitive* under NWT General Species Rankings (GNWT 2024). No moss SOCC are listed under COSEWIC (GOC 2023).<br>• Plant species having socio-economic or traditional importance may have potential to be present within the disturbance footprint.<br>• Weeds may be present within and adjacent to the disturbance footprint.<br>**Interactions**<br>Interactions with vegetation may occur during construction due to:<br>• vegetation clearing<br>• soil stripping and grading<br>• vehicle and equipment movement | | | | • Consider placing mats over infested areas to reduce the potential transport of weeds. Where mats are used ensure they are free of soil, vegetation and debris prior to removal from the site. | construction of the Replacement Activities on vegetation are anticipated to occur. Effects will be limited to the disturbance footprint for the duration of construction. Post-construction reclamation activities will be undertaken following construction.<br>Residual effects are predicted to be not significant. | | |
| Water Quality and Quantity | Y | • The Replacement Activities are approximately 3.58 ha in area, including the entry side workspace on Bear Island and exit side workspace and HDD pullback on Goose Island. There is one marsh located outside the disturbance footprint adjacent to the HDD pullback.<br>• The Replacement Activities will cross a channel of the Mackenzie River. The channel will be crossed via trenchless watercourse crossing method (i.e., HDD). This method does not involve direct disturbance to the bed or banks of or instream work within the Mackenzie River. HDD entry and exit workspace will be located outside the riparian area of the Mackenzie River.<br>• Water withdrawals for construction and hydrostatic testing will be required. Water use will be under a water license issued by the Sahtu Land and Water Board and hydrostatic test water will be sourced and disposed of according to the license.<br>• There is potential for interaction with surface water during construction as there are waterbodies and watercourses within 100 m of the disturbance footprint.<br>• The potential for alteration of groundwater quality or quantity is low as due to the location of the Replacement Activities on natural islands in the Mackenzie River. Furthermore, excavation activities will be limited to the tie-in of flowlines. | Complete | Change to surface water quality or quantity during construction due to:<br>• Increased suspended sediment concentrations and transport in surface water due to vegetation clearing or increased erosion on the disturbance footprint, and release of hydrostatic test water<br>• Construction activity on land adjacent to waterbodies resulting in changes in natural flow patterns<br>• Temporary diversions for HDD or hydrostatic testing, or release of test water resulting in change in stream discharge | Y | • Conditions of applicable water licenses will be followed while diverting water, conducting dewatering activities and for hydrostatic testing.<br>• The Environmental Inspector or designated alternate will inspect discharge piping to ensure it is free of leaks and properly anchored.<br>• Use secondary containment for equipment (pumps, generators to reduce the likelihood of spills.<br>• Direct water to a well-vegetated low-lying upland area through a filtration device and flow dissipators as required to ensure discharge does not result in release of sediment, scouring or erosion.<br>• Size geotextile filter bags appropriately for the planned discharge and suspended sediment size.<br>• Do not allow sediment-laden water from pumping activities to directly enter a watercourse or wetland.<br>• The discharge location shall be inspected daily to verify:<br>○ no substantial erosion or sedimentation is occurring | Change to surface water quantity and quality may occur:<br>• Trenchless crossing methods and the use of erosion control measures at excavated areas will mitigate risk to surface water quality in nearby waterbodies. No stripping or grading outside the entry and exit sites is planned, which will limit the potential for erosion and sedimentation.<br>• The implementation of standard mitigation measures, such as erosion and sediment control measures and management of drilling fluid, will effectively mitigate the potential for the transport of sediment resulting in change in surface water quality.<br>• Temporary diversions for HDD or hydrostatic testing are not anticipated to result in changes to surface water quality or | Past and present projects and physical activities have influenced the baseline conditions for water quality and quantity in the region (e.g., oil and gas, transportation infrastructure).<br><br>Cumulative effects on surface water and groundwater quality and quantity are likely to occur as a result of ongoing disturbance that has been and continues to occur in the area as a result of industrial development. With the implementation of mitigation measures, the Replacement Activities are predicted to make a negligible | Monitoring and inspection will occur during construction. |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

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| | | • The potential release of drilling fluid into a watercourse during HDD is discussed under the Accidents and Malfunctions element in this table.<br>• The potential introduction of deleterious substances into a watercourse during construction activities is discussed under the Accidents and Malfunctions element in this table.<br><br>**Interactions**<br>Interactions with water quality and quantity could occur during construction due to:<br>• vegetation removal<br>• soil stripping and grading<br>• excavation and water management<br>• vehicle and equipment movement<br>• water withdrawal and release | | Change to groundwater quality and quantity during construction due to:<br>• Alteration of groundwater levels or flow rate due to dewatering of tie-in excavations or pits associated with HDD activities. | | ○ water being discharged does not contain any oil or other substances in amounts sufficient to create a visible film, sheen or foam in the discharge water<br>○ discharge water is not reaching a watercourse or wetland<br>• If dewatering discharge reaches a watercourse, discharge water must not exceed the least stringent criteria of 8 nephelometric turbidity units (NTUs) above background levels or 10% above background levels of the watercourse.<br>• Contain all drilling water and drilling waste for reuse or disposal.<br>• Water withdrawals must not exceed the limits in applicable water licenses.<br>• Following the completion of hydrostatic tests, hydrostatic test water will be sampled in accordance with Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines and either discharged over land if guidelines are met or disposed of.<br>• A Turbidity Monitoring Plan (TMP) will be developed prior to construction. A qualified environmental professional will conduct turbidity monitoring during construction to detect an inadvertent return of drilling fluid into a watercourse. The TMP will include the following measures:<br>○ Complete turbidity monitoring during horizontal directional drilling.<br>○ Immediately notify the Lead Driller of any changes in turbidity levels.<br>○ Notify the Environmental Inspector and Construction Manager as soon as possible following an | quantity due to the scope of the Replacement Activities and flow volumes in the Mackenzie River. The amount of water withdrawn for HDD or hydrostatic testing and water disposal will be in accordance with applicable water licenses.<br><br>Change in groundwater quality and quantity may occur:<br>• Construction dewatering may result in limited short-term and localized effects on groundwater quality and flow patterns, including shallow groundwater (if present). If dewatering is required during construction, standard mitigation to manage dewatering will be followed.<br><br>After the implementation of mitigation measures, minimal adverse residual effects of construction of the Replacement Activities on water quality and quantity are anticipated to occur. Effects will be short-term in duration and post-construction reclamation activities will be undertaken following construction.<br>Residual effects are predicted to be not significant. | contribution to ongoing cumulative effects on water quality and quantity at the regional scale. | |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

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| | | | | | | exceedance of specified turbidity levels.<br>• Follow the Inadvertent Fluid Release Contingency Plan (EPP - Appendix B) in the event of an observed or suspected return of drilling fluid to surface or to a waterbody.<br>• The Drilling Contractor shall monitor the volume, pressure and parameters of drilling fluid to detect any losses during drilling operations.<br>• If an inadvertent return of drilling fluid is identified offsite, cleanup procedures will be developed in consultation with the Imperial Environment and Regulatory Advisor and Environmental Inspector. | | | |
| Fish and Fish Habitat | Y | • The Replacement Activities will cross a channel of the Mackenzie River, which is a fish-bearing watercourse. Fish species that occur in the Mackenzie River near Norman Wells include arctic grayling (*Thymallus arcticus*), broad whitefish (*Coregonus nasus*), lake whitefish (*Coregonus clupeaformis*), inconnu (*Stenodus leucichthys*), burbot (*Low lota*), bull trout (*Salvelinus confluentus*), Dolly Varden (*Salvelinus malma*), arctic cisco (*Coregonus atumnali*), least cisco (*Coregonus sardinella*), and walleye (*Stizostedion vitreum*) (Amec Foster Wheeler 2016).<br>• Arctic grayling and inconnu are listed as *sensitive* under NWT General Species Rankings (GNWT 2024).<br>• Bull trout and Dolly Varden are listed under SARA Schedule 1 as special concern (GOC 2023). Species listed as special concern or sensitive have no regulatory requirements associated with them under SARA.<br>• Fish species having socio-economic or traditional importance are present within the Mackenzie River near Norman Wells.<br>• The channel will be crossed via trenchless watercourse crossing method (i.e., HDD). This method does not involve direct disturbance to the bed or banks of or instream work within the Mackenzie River. HDD entry and exit workspace will be located outside the riparian area of the Mackenzie River. Therefore, the Replacement Activities are not | Complete | Change in fish habitat during construction due to:<br>• Construction activity on land adjacent to waterbodies resulting in changes to bank stability, loss of riparian habitat, sedimentation, or in increased erosion potential<br>• Temporary diversions for HDD or hydrostatic testing resulting in changes to habitat availability<br>Change in fish mortality risk during construction due to:<br>• Mobilization and transport of sediment resulting in fish mortality from gill abrasion and/or limited foraging ability, or mortality of fish eggs | Y | • Conditions of applicable water licenses will be followed while diverting water, conducting dewatering activities and for hydrostatic testing.<br>• Where construction during adverse weather conditions have the potential to result in wind/water erosion, excessive rutting, decreased soil capability or the potential for serious harm to fish and fish habitat, temporary shutdowns may be necessary. Temporary shutdowns will be based upon discussions between the Construction Manager, Contractor and Imperial Environment and Regulatory Advisor or Environmental Inspector. The Construction Manager must authorize resumption of work in consultation with the Imperial Environment and Regulatory Advisor or the Environmental Inspector prior to restart.<br>• Store deleterious substances (including fuel and oil) at least 30 m from watercourses and wetlands.<br>• Ensure all containers, hoses and nozzles are free of leaks. | Change in fish habitat and fish mortality may occur:<br>• Construction of the Replacement Activities in proximity to the Mackenzie River has potential to result in sediment releases that might affect fish and fish habitat. The implementation of standard mitigation measures, such as erosion and sediment control measures and management of drilling fluid, will effectively mitigation the potential for the mobilization and transport of sediment.<br>• Temporary diversions for HDD or hydrostatic testing are not anticipated to result in changes to fish habitat availability or fish mortality due to the limited scope of the Replacement Activities and relative size of the Mackenzie River. The amount of water | As there are no predicted residual effects of construction of the Replacement Activities on fish and fish habitat, a cumulative effects assessment is not warranted. | Monitoring and inspection will occur during construction. |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| | | expected to cause harmful alteration, disruption or destruction of fish habitat, as defined under the federal *Fisheries Act*.<br>• There is potential for interaction with fish habitat through sediment releases during construction as there is a fish-bearing watercourse within 100 m of the disturbance footprint.<br>• Water withdrawals for construction and hydrostatic testing will be required. Water use will be under a water license issued by the Sahtu Land and Water Board and hydrostatic test water will be sourced and disposed of according to the license and in accordance with the DFO measures to protect fish and fish habitat.<br>• The potential release of drilling fluid into a watercourse during HDD is discussed under the Accidents and Malfunctions element in this table.<br>• The potential introduction of other deleterious substances into a watercourse during construction activities is discussed under the Accidents and Malfunctions element in this table.<br><br>**Interactions**<br>Interactions with fish and fish habitat could occur during construction due to:<br>• Construction activities on land adjacent to fish-bearing watercourses<br>• Water withdrawal and release | | • Change in timing, duration and frequency of flow during temporary diversions, resulting in fish mortality by stranding, entraining or impinging fish, or by preventing access to spawning areas<br>• Destruction of fish and/or eggs during temporary diversions<br>• Introduction of alien species | | • Use secondary containment when storing deleterious substances within 30 m of watercourses and wetlands.<br>• Refuelling should be undertaken a minimum of 30 m from wetlands and watercourses to reduce potential impacts to surface water quality if a spill occurs. If maintaining a 30 m refuelling distance is not possible, special refueling procedures for sensitive areas should be undertaken subject to approval by the Environmental Inspector.<br>• Equipment or machinery shall not be washed within 30 m of watercourses or wetlands.<br>• Use secondary containment for equipment (pumps, generators) to reduce the likelihood of spills.<br>• Direct water to a well-vegetated low-lying upland area through a filtration device and flow dissipators as required to ensure discharge does not result in release of sediment, scouring or erosion.<br>• Size geotextile filter bags appropriately for the planned discharge and suspended sediment size.<br>• Do not allow sediment-laden water from pumping activities to directly enter a watercourse or wetland.<br>• The discharge location shall be inspected daily to verify:<br>  ○ no substantial erosion or sedimentation is occurring<br>  ○ water being discharged does not contain any oil or other substances in amounts sufficient to create a visible film, sheen or foam in the discharge water<br>  ○ discharge water is not reaching a watercourse or wetland<br>• If dewatering discharge reaches a watercourse, discharge water must | withdrawn for HDD or hydrostatic testing will be in accordance with applicable water licenses. The potential effects of water withdrawal on fish mortality can be effectively mitigated by following DFO's Interim Code of Practice for End-of-pipe Fish Protection Screens for Small Water Intakes in Freshwater (DFO 2020).<br>After the implementation of mitigation measures, residual effects of construction of the Replacement Activities on fish and fish habitat are not anticipated.<br>Residual effects are predicted to be not significant. | | |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| | | | | | | not exceed the least stringent criteria of 8 nephelometric turbidity units (NTUs) above background levels or 10% above background levels of the watercourse.<br>• Equip and maintain any water intakes with a screen designed to prevent impingement or entrainment of fish. Screen intakes in accordance with the Interim Code of Practice: End-of-Pipe Fish Protection Screens for Small Water Intakes in Freshwater (DFO 2020).<br>• Contain all drilling water and drilling waste for reuse or disposal.<br>• Complete turbidity monitoring during horizontal directional drilling.<br>• Immediately notify the Lead Driller of any changes in turbidity levels.<br>• Notify the Environmental Inspector and Construction Manager as soon as possible following an exceedance of specified turbidity levels.<br>• Follow the Inadvertent Fluid Release Contingency Plan (Appendix B) in the event of an observed or suspected return of drilling fluid to surface or to a waterbody.<br>• The Drilling Contractor shall monitor the volume, pressure and parameters of drilling fluid to detect any losses during drilling operations.<br>• If an inadvertent return of drilling fluid is identified offsite, cleanup procedures will be developed in consultation with the Imperial Environment and Regulatory Advisor and Environmental Inspector.<br>• Following the completion of hydrostatic tests, hydrostatic test water will be sampled in accordance with Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines and either discharged over land if guidelines are met or disposed of. | | | |
| Wetlands | N | • The disturbance footprint is approximately 3.58 ha in area, including the entry side workspace on Bear | N/A | None | N | None | N/A | N/A | N/A |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| | | Island and exit side workspace and HDD pullback on Goose Island. There is one marsh located outside the disturbance footprint adjacent to the HDD pullback.<br>• There is potential for interaction with wetlands during construction as there is a marsh wetland within 30 m of the disturbance footprint. However, the marsh will be avoided during construction as it is located outside of the disturbance footprint. Standard mitigation, such as erosion and sediment control measures, will be implemented during construction to address potential interactions with the marsh. As a result, further assessment of potential effects on wetlands is not warranted. | | | | | | | |
| Wildlife and Wildlife Habitat | Y | • The Replacement Activities are located on Goose and Bear islands, which are natural islands in the Mackenzie River adjacent to Norman Wells. The islands are subject to seasonal flooding/ice scouring.<br>• The Replacement Activities are located on private lands in the Norman Wells Proven Area and adjacent to Imperial's existing NWO on the Mainland and Goose and Bear islands.<br>• The disturbance footprint is approximately 3.58 ha in area, including the entry side workspace on Bear Island and exit side workspace and HDD pullback on Goose Island. Of this, 1.81 ha occurs within previously disturbed areas used for Imperial's existing NWO and 1.77 ha is native vegetation. No new permanent disturbance is required.<br>o Vegetation within previously disturbed areas (i.e., vegetated right-of-way; 1.30 ha) is comprised of early seral stage communities (i.e., shrub, grass and forb-dominated).<br>o Native vegetation is comprised of early seral stage communities (i.e., shrub). Vegetation in these areas (1.77 ha) may be previously undisturbed or may be shrubland regenerating to forest.<br>• Mobilization of vehicles and equipment to Norman Wells will occur in winter 2024-2025 along existing ice roads and existing barges in the summer months. Access to the disturbance footprint will occur in summer 2025 using barge operated by Imperial; barge infrastructure at Norman Wells and Goose and Bear islands is existing.<br>• There are 18 wildlife species at risk and species of management concern that have been previously | Complete | Change to wildlife habitat during construction due to:<br>• Direct loss or alteration of habitat from vegetation clearing and ground disturbance<br>• Indirect loss or alteration of habitat effectiveness through sensory disturbance<br>Change in mortality risk during construction due to:<br>• Construction-related works and activities resulting in physical destruction of key habitat features (e.g., nests, dens, roosts)<br>• Construction-related works and activities resulting in accidental mortality of small, less mobile species or individuals (e.g., amphibians, juvenile birds) | Y | • Conduct pre-disturbance assessments to identify environmental features in and adjacent to the disturbance footprint prior to commencement of construction.<br>• Tree and vegetation removal (including brushing) should be completed outside the primary nesting period for migratory birds (May 7 – August 10) to avoid disturbance to nesting birds protected under the Migratory Birds Convention Act (MBCA).<br>• Complete migratory bird nest sweeps as necessary prior to vegetation removal if vegetation removal is planned during the migratory bird nesting period.<br>• In the event an active bird nest is identified, the nest will be subject to site-specific mitigation measures. Appropriate mitigation measures will be selected by the Environmental Inspector or Wildlife Resource Specialist.<br>• Silt fencing is recommended along the perimeter of the work area to exclude amphibians from the work area.<br>• No construction personnel shall harass, threaten or injure wildlife.<br>• Construction personnel are not | Change to wildlife habitat will occur:<br>• Up to 1.77 ha of shrubland and 1.30 ha may be cleared during construction, resulting in direct disturbance to wildlife habitat, although the actual area of disturbance is expected to be less due to use of matting. Following construction, vegetation will be allowed to re-establish. Where required during operations, on-going vegetation brushing will be completed within Imperial's existing disposition to satisfy regulatory and operational requirements.<br>• Wildlife habitat near the disturbance footprint may become less suitable during construction due to sensory disturbance to wildlife (e.g., light and noise).<br>Change in wildlife mortality risk may occur for insects, birds, amphibians, and small mammals. It is unlikely that larger mammals will be | Past and present projects and physical activities have influenced the baseline conditions for wildlife and wildlife habitat in the region (e.g., oil and gas, transportation infrastructure).<br><br>Cumulative effects on wildlife and wildlife habitat are likely to occur as a result of ongoing disturbance that has been and continues to occur in the area as a result industrial development.<br><br>With the implementation of mitigation measures, the Replacement Activities are predicted to make a negligible contribution to ongoing cumulative effects on wildlife | Monitoring and inspection will occur during construction. |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| | | noted near the disturbance footprint, including three mammals, 11 birds, and four insects.<br>○ Of the three mammal SOCC, Boreal caribou (*Rangifer tarandus caribou*) is listed as *threatened* under the NWT Species at Risk Act, *at risk* under NWT General Species Rankings, and *threatened* under SARA Schedule 1 (GNWT 2024, GOC 2023). Grizzly Bear *(Ursus arctos*) is listed as *threatened* under the NWT Species at Risk Act, *special concern* under NWT General Species Rankings, and *special concern* under SARA Schedule 1 (GNWT 2024, GOC 2023). Wolverine (*Gulo gulo*) is listed as *not at risk* under the NWT Species at Risk Act, *sensitive* under NWT General Species Rankings, and *special concern* under SARA Schedule 1 (GNWT 2024, GOC 2023). The disturbance footprint overlaps the ranges of all three mammal SOCC and falls within the designated critical habitat range for Woodland Caribou (Boreal population) (GOC, N.D).<br>○ Of the 11 bird SOCC, two are listed as *at risk* and nine are listed as *sensitive* under NWT General Species Rankings; two are listed as *threatened* and seven are listed as *special concern* under SARA Schedule 1 and three are listed as *threatened* and seven are listed as *special concern* under COSEWIC (GNWT 2024, GOC 2023). The disturbance footprint overlaps with the ranges of all bird SOCC: Bank Swallow (*Riparia riparia*), Barn Swallow (*Hirundo rustica*), Common Nighthawk (*Chordeiles minor*), Harris's Sparrow (*Zonotrichia querula*), Horned Grebe (*Podiceps auritus*), Lesser Yellowlegs (*Tringa flavipes*), Olive-sided Flycatcher (*Contopus cooperi*), Peregrine Falcon *(Falco peregrinus anatum/tundrius*), Red-necked Phalarope (*Phalaropus lobatus*), Rusty Blackbird (*Euphagus carolinus*), Short-eared Owl (*Asio flammeus*) (GNWT 2024)..<br>○ Of the four insects, two are listed as *at risk* and one is listed as *sensitive* under NWT General Species Rankings; one is listed as *endangered* and two are listed as *special concern* under SARA Schedule 1; and one is listed as *endangered*, one is listed as *threatened,* and two are listed as *special concern* under COSEWIC (GNWT 2024, GOC 2023). The disturbance footprint overlaps with the ranges of all insect SOCC: Gypsy Cuckoo Bumble Bee (*Bombus* | | • Trapped wildlife (i.e., within open excavations)<br>• Vehicle-wildlife collisions<br>• Wildlife-human conflict | | permitted to hunt or fish on the work site.<br>• Firearms are not permitted in vehicles, on worksites or at any associated facilities.<br>• If wildlife is discovered within a construction work area, report to the Imperial Environmental Inspector or Environment and Regulatory Advisor who will contact applicable regulatory authorities as required.<br>• If wildlife is encountered during construction, personnel are required to move away from the animal and wait for the animal to move off the construction site.<br>• Report any incidents with nuisance wildlife or collisions with wildlife to the Environmental Inspector, who will notify applicable regulatory authorities as appropriate.<br>• Cap pipe ends to limit the potential for wildlife to become trapped or confined. If pipe caps are not installed, check for confined or trapped animals prior to pipe movement/installation.<br>• Do not leave spent welding rods, filings/shavings from end preparation or cut off pipe rings on the ground. During beveling operations, collect pipe bevel shaving debris to limit potential for wildlife to ingest shavings. Contain and collect debris from sandblasting operations. | present on or near the disturbance footprint due to its location on Bear and Goose islands and adjacent to Imperial's existing NWO.<br>• Vegetation clearing is currently planned for winter 2024-2025 and construction will occur in summer 2025. Construction is scheduled to overlap with the primary nesting period for migratory birds (May 7 – August 10). Pre-construction wildlife surveys (e.g., nest searches), will be conducted where applicable.<br>• Sensory disturbance may affect nest success for migratory birds in adjacent habitat and potentially disturb active species nearby (e.g., insects, birds). Increased traffic volumes to the site during construction could result in increased risk of vehicle-wildlife collisions (e.g., during mobilization of vehicles and equipment to Norman Wells).<br>• Construction activities are not anticipated to result in increased conflict between wildlife (e.g., bears) and humans due to the low suitability of the project area to support large mammals.<br><br>After the implementation of mitigation measures, minimal adverse residual effects of construction of the Replacement Activities on | and wildlife habitat at the regional scale. | |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| | | *bohemicus*), Suckley's Cuckoo Bumble Bee (*Bombus suckleyi*), Transverse Lady Beetle (*Coccinella transversoguttata*), Yellow-banded Bumble Bee (*Bombus terricola*) (GNWT 2024).<br>• Wildlife species having socio-economic or traditional importance may be present within the disturbance footprint.<br>• The disturbance footprint occurs within the following wildlife zones:<br>  ○ Important Bird Area (IBA) Middle Mackenzie River Islands: NT081 (IBA Canada N.D.)<br>  ○ Primary Nesting Zone B8 (May 7 - August 10) (ECCC 2023a)<br><br>**Interactions**<br>Interactions with wildlife and wildlife habitat could occur during construction due to:<br>• vegetation clearing<br>• soil stripping and grading<br>• excavation<br>• vehicle and equipment movement<br>• increased noise<br>• increased traffic | | | | | wildlife and wildlife habitat are anticipated to occur. Effects will be short-term in duration (i.e., the construction period; approximately 5 months). Post-construction reclamation activities will be undertaken following construction.<br>Residual effects are predicted to be not significant. | | |
| Species at Risk, or Species of Special Status, and related habitat | Y | **SARA-listed Species**<br>• The following fish species listed under SARA Schedule 1 have been documented in the Mackenzie River near Norman Wells: Bull trout and Dolly Varden, which are both listed as special concern (GOC 2023). Species listed as special concern have no regulatory requirements associated with them under SARA.<br>• The following wildlife species listed under SARA Schedule 1 have been documented near the disturbance footprint: boreal caribou (*threatened*), grizzly bear (*special concern*), wolverine (*special concern*), bank swallow (*threatened*), barn swallow (*threatened*), commo nighthawk (*special concern*), Harris's sparrow (*special concern*), horned grebe (*special concern*), olive-sided flycatcher (*special concern*), red-necked phalarope (*special concern*), rusty blackbird (*special concern*), short-eared owl (*special concern*), gypsy cuckoo bumble bee (*endangered*), transverse lady beetle (*special concern*), and yellow-banded bumble bee (*special concern*). Species listed as special concern have no | Complete | Change to habitat for species at risk and species of conservation concern may occur during construction.<br><br>Change to movement of wildlife species at risk and species of conservation concern may arise during construction.<br><br>Change to mortality risk for wildlife species at risk and species of conservation concern may occur during construction. | Y | • See the Vegetation element of this table for SAR or SOCC specific mitigations.<br>• See the Fish and Fish Habitat element of this table for SAR of SOCC specific mitigations.<br>• See the Wildlife and Wildlife Habitat element of this table for SAR or SOCC specific mitigations. | See the Vegetation element of this table for predicted residual effects of the Replacement Activities on vegetation.<br><br>See the Fish and Fish Habitat element of this table for predicted residual effects of the Replacement Activities on fish and fish habitat.<br><br>See the Wildlife and Wildlife Habitat element of this table for predicted residual effects of the Replacement Activities on wildlife and wildlife habitat. | See the Vegetation element of this table for predicted residual cumulative effects on vegetation, including vegetation species of conservation concern and species at risk.<br><br>See the Fish and Fish Habitat element of this table for predicted residual cumulative effects on fish, including fish species of conservation concern and | Monitoring and inspection will occur during construction. |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| | | regulatory requirements associated with them under SARA (GOC 2023).<br>• The disturbance footprint overlaps the ranges of all species at risk documented near the disturbance footprint and falls within the designated critical habitat range for Woodland Caribou (Boreal population) (GWNT 2024, GOC N.D).<br><br>**Species of Conservation Concern (SOCC)**<br>• Arctic grayling and inconnu are listed as *sensitive* under NWT General Species Rankings (GNWT 2024).<br>• There are 136 vascular, 31 lichen, and 1 moss species of conservation concern (SOCC) with the potential to occur within the Taiga Plains LS ecoregion.<br>o Of the 136 vascular SOCC, 65 are listed as *may be at risk* and 71 are listed as *sensitive* under NWT General Species Rankings. Yukon aster (*Symphyotrichum yukonense*) and Tyrrell's willow (*Salix tyrrellii*) are on the *Species at Risk Act* (SARA) registry but were downgraded to *not at risk* in 1996 and 1999 (GOC 2023). Both species are still listed as *may be at risk* under NWT General Species Rankings (GNWT 2024).<br>o Of the 30 lichen SOCC, 4 are listed as *may be at risk* and 27 are listed as *sensitive* under NWT General Species Rankings (GNWT 2024). No lichen SOCC are listed under COSEWIC (GOC 2023).<br>o The moss SOCC is listed as sensitive under NWT General Species Rankings (GNWT 2024). No moss SOCC are listed under COSEWIC (GOC 2023)<br>• There are 18 wildlife species at risk and species of conservation concern previously noted near the disturbance footprint, including three mammals, 11 birds, and four insects.<br>o Of the three mammal SOCC, Boreal caribou (*Rangifer tarandus caribou*) is listed as *threatened* under the NWT Species at Risk Act and *at risk* under NWT General Species Rankings (GNWT 2024). Grizzly Bear *(Ursus arctos*) is listed as *threatened* under the NWT Species at Risk Act and *special concern* under NWT General Species Rankings (GNWT 2024). Wolverine (*Gulo gulo*) is listed as *not at risk* under | | | | | | species at risk.<br><br>See the Wildlife and Wildlife Habitat element of this table for predicted residual cumulative effects on wildlife, including wildlife species of conservation concern and species at risk. | |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| | | the NWT Species at Risk Act and *sensitive* under NWT General Species Rankings (GNWT 2024).<br>○ Of the 11 bird SOCC, two are listed as *at risk* and nine are listed as *sensitive* under NWT General Species Rankings and three are listed as *threatened* and seven are listed as *special concern* under COSEWIC (GNWT 2024, GOC 2023).<br>○ Of the four insects, two are listed as *at risk* and one is listed as *sensitive* under NWT General Species Rankings (GNWT 2024).<br><br>**Interactions**<br>• See the Vegetation, Fish and Fish Habitat and Wildlife and Wildlife Habitat elements of this table for interactions relevant to SAR and SOCCs. | | | | | | | |
| Air Emissions | Y | • Interactions will occur during construction of the Replacement Activities due to the release of Criteria Air Contaminants (CACs) from construction vehicle and equipment use.<br>• Vehicle and equipment CAC emissions will occur intermittently and will be short-term in duration (approximately 5 months). | Complete | Change in ambient air quality during construction due to:<br>• CAC emissions from equipment and vehicles burning hydrocarbon fuel. | Y | • During construction, motorized construction equipment should be equipped with functioning mufflers and silencers. Company and construction personnel should avoid excessive idling of vehicles; vehicles and equipment should be turned off when not in use unless required for operation.<br>• Use barges to transport crews to and from the worksite.<br>• Equipment must be well-maintained during construction and maintenance activities to reduce emissions. | Change in ambient air quality will occur:<br>• Effects on ambient air quality from construction phase CAC emissions were not quantitatively assessed because emissions are expected to be minor, transient and occur for only short intervals. These emissions will be addressed through the use of codified practices, proven effective mitigation measures, and best management practices.<br><br>After the implementation of mitigation measures, adverse residual effects of construction of the Replacement Activities on air emissions are predicted to be negligible.<br>Residual effects are predicted to be not significant. | The contribution of the Replacement Activities to existing cumulative effects on air quality is considered negligible at the regional scale. Any residual effects will be short-term during construction of the Replacement Activities. As a result, a further quantitative assessment of cumulative effects on air emissions is not warranted. | Monitoring and inspection will occur during construction |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| Greenhouse Gas (GHG) Emissions | Y | • GHG emissions will be released from construction during the following activities:<br>  ○ vehicle and equipment movement and operation<br>  ○ change in land cover, including burning or decay of cleared vegetation<br>• The purpose of the Replacement Activities is to replace existing flowlines. Additional fugitive emissions during operation not anticipated.<br>• No additional power draw is anticipated to operate the flowlines, therefore no additional third-party (indirect) emissions are predicted.<br>• A change to upstream emissions is not predicted, as the Replacement Activities will replace existing flowlines, and therefore are not anticipated to increase flowline throughput. | Complete | Release of direct GHG emissions during construction due to:<br>• equipment and vehicles burning hydrocarbon fuel<br>• change in land cover, including burning or decay of cleared vegetation | Y | • During construction, motorized construction equipment should be equipped with functioning mufflers and silencers. Company and construction personnel should avoid excessive idling of vehicles; vehicles and equipment should be turned off when not in use unless required for operation.<br>• Use barges to transport crews to and from the worksite.<br>• Equipment must be well-maintained during construction and maintenance activities to reduce emissions. | Change in GHG emissions will occur:<br>• The volume of direct GHG emissions was not estimated because emissions are expected to be minor, transient and occur for only short intervals. Construction of the Replacement Activities is expected to emit a negligible proportion of the 2021 Canada, Northwest Territories, and Canadian sector (Oil and Natural Gas Transmission) GHG emission totals (ECCC 2023b) during construction activities. Construction of the Replacement Activities will not notably hinder the Government of Canada's efforts to reduce GHG emissions. | Cumulative effects associated with the releases of GHGs are a global issue and are not limited to provincial or national borders. GHG sources, sinks, and reservoirs around the world contribute to the cumulative effect. The Intergovernmental Panel on Climate Change (IPCC) forecasts global GHG emissions in various scenarios and determines the impacts of the forecasts. The assessment of cumulative effects is beyond the scope of this assessment. | Monitoring and inspection will occur during construction. |
| Acoustic Environment | Y | • Interactions will occur during construction of the Replacement Activities due to noise generated by equipment and vehicles use and HDD activities. | Complete | Change in existing sound levels during construction due to:<br>• Noise emissions from construction vehicles and equipment can have potential annoyance effects on human receptors | Y | • During construction, motorized construction equipment should be equipped with appropriate mufflers and silencers as available. | Although noise sources will increase during construction activities due to operation of construction vehicles and equipment, any such change in noise levels will be limited to the construction period and will be short term in duration (approximately 5 months). Potential effects will be addressed through the use of codified practices, proven effective mitigation measures and best management practices. As a result, a further quantitative assessment of construction phase noise was not completed.<br><br>After the implementation of mitigation measures, adverse residual effects of | The contribution of the Replacement Activities to existing cumulative effects on the acoustic environment is considered negligible at the regional scale. Any residual effects will be short-term during construction of the Replacement Activities. As a result, a further quantitative assessment of cumulative effects on the acoustic environment is not warranted. | Monitoring and inspection will occur during construction |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| | | | | | | | construction of the Replacement Activities on the acoustic environment are predicted to be negligible.<br>Residual effects are predicted to be not significant. | | |
| Human Occupancy and Resource Use | N | • The Replacement Activities are located on Goose and Bear islands, which are natural islands in the Mackenzie River adjacent to Norman Wells.<br>• The Replacement Activities are located on private lands in the Norman Wells Proven Area and adjacent to Imperial's existing NWO on the Mainland and Goose and Bear islands.<br>• The disturbance footprint is approximately 3.58 hectares (ha) in area, including the entry side workspace on Bear Island and exit side workspace and HDD pullback on Goose Island. Of this, 1.81 ha occurs within previously disturbed areas used for Imperial's existing NWO and 1.77 ha is native vegetation. No new permanent disturbance is required.<br>• Mobilization of vehicles and equipment to Norman Wells will occur in winter 2024-2025 along existing ice roads and existing barges in the summer months. Access to the disturbance footprint will occur in summer 2025 using a barge operated by Imperial; barge infrastructure at Norman Wells and Goose and Bear islands is existing.<br>• Surrounding land uses may include hunting, trapping, and fishing. However, access to the disturbance footprint is currently restricted and there are existing levels of sensory disturbance (e.g., noise, dust) that may deter users of the land and adjacent waterways due to Imperial's existing operations. Construction of the Replacement Activities are not anticipated to change land use patterns and/or access to land and waterways in the region.<br>Interactions with human occupancy and resource use during construction are thus not anticipated. | N/A | None | N | None | N/A | N/A | N/A |
| Heritage Resources | Y | • The Replacement Activities are located on Goose and Bear islands, which are natural islands in the Mackenzie River adjacent to Norman Wells. The islands are subject to seasonal flooding/ice scouring.<br>• The Replacement Activities are located on private lands in the Norman Wells Proven Area and adjacent | Complete | Change to heritage resources during construction due to:<br>• Loss or disturbance to site contents and/or site contexts | Y | • Should previously unknown archaeological resources be uncovered or suspected of being uncovered during construction, ground disturbance in the find location should cease immediately. A site-specific response plan should | The archaeological site potential of the disturbance footprint is low and change to heritage resources is not anticipated to occur during construction of the Replacement Activities. With | As there are no predicted residual effects of construction of the Replacement Activities on heritage resources, | Monitoring and inspection will occur during construction. |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| | | to Imperial's existing NWO on the Mainland and Goose and Bear islands.<br>• The disturbance footprint is approximately 3.58 hectares (ha) in area, including the entry side workspace on Bear Island and exit side workspace and HDD pullback on Goose Island. Of this, 1.81 ha occurs within previously disturbed areas used for Imperial's existing NWO and 1.77 ha is native vegetation. No new permanent disturbance is required.<br>• Due to the location of the Replacement Activities (i.e., previously disturbed area subject to seasonal flooding/ice scouring), the archaeological site potential is rated as low and an Archaeological Overview Assessment is not required per consultation with the Culture and Heritage Division of Government of Northwest Territories Department of Education, Culture and Employment (GWNT-ECE) at Prince of Wales Northern Heritage Centre (PWNHC).<br>**Interactions**<br>Interactions with heritage resources could occur during construction due to:<br>• vegetation clearing<br>• soil stripping and grading<br>• excavation<br>• vehicle and equipment movement | | through ground disturbance associated with brush and/ or topsoil removal, grading, vehicle traffic and use of workspaces during construction activities<br>• Vandalism or unauthorized artifact collection by workers during construction | | then be employed following further investigation of the specific find. The response plan would indicate under which conditions the ground disturbance activity in the find location may resume.<br>• The following is the site-specific response plan should any archaeological resource be found:<br>○ immediately cease any construction around the found resource<br>○ notify the Imperial Environment and Regulatory Advisor or the Environmental Inspector<br>○ notify the Construction Manager<br>○ notify a Licensed Archaeologist to assess the found resource and which actions may be required<br>○ work shall not resume until the Construction Manager provides approval<br>○ the Environment Inspector will mark areas that are required to be avoided if applicable | the implementation of mitigation measures, residual effects on heritage resources are not anticipated. | a cumulative effects assessment is not warranted. | |
| Navigation and Navigation Safety | N | • Replacement Activities include construction under a channel of the Mackenzie River, which is listed as a scheduled waterway under the Canadian Navigable Waters Act.<br>• The channel will be crossed via trenchless watercourse crossing method (i.e., HDD). This method does not involve direct disturbance to the bed or banks of or instream work within the Mackenzie River. HDD entry and exit workspace will be located outside the riparian area of the Mackenzie River. Therefore, the Replacement Activities are designed to avoid causing interference with navigation in the Mackenzie River.<br>• The HDD will be constructed in accordance with requirements of Section 21 of the Canadian *Navigable Waters Act* Minor Works Order for placement of guiding cables on the watercourse bed during trenchless watercourse crossings. | N/A | None | N | None | N/A | N/A | N/A |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| | | • The potential release of drilling fluid into a watercourse during HDD is discussed under the Accidents and Malfunctions element in this table.<br>No interactions with navigation and navigation safety are predicted. | | | | | | | |
| Indigenous Traditional Land and Resource Use | N | • The Indigenous and treaty rights exercised or practiced in the region where the Replacement Activities are located are understood to include hunting, trapping, fishing and undertaking cultural pursuits; these activities are closely connected to and informed by environmental, health, social and economic conditions required also for Indigenous land and resource use. Therefore, interactions with Indigenous traditional land and resource use are described in the Rights of Indigenous Peoples element in this table to reduce duplication of information. | Underway | See the Rights of Indigenous Peoples element in this table. | Y | See the Rights of Indigenous Peoples element in this table. | See the Rights of Indigenous Peoples element in this table. | See the Rights of Indigenous Peoples element in this table. | See the Rights of Indigenous Peoples element in this table. |
| Social and Cultural Well-Being | N | • The Replacement Activities have a limited scope and relatively small workforce requirements (approximately 33 workers average; 45 workers at peak), and construction activities will be short-term in duration (approximately 5 months). No additional workers are required to operate the flowlines.<br>• The Replacement Activities are located on Goose and Bear islands, which are natural islands in the Mackenzie River adjacent to Norman Wells.<br>• Contractors will stay in existing local commercial accommodations (e.g., hotel, camp) during construction.<br>• It is unlikely that the construction workforce will disproportionately affect the social and cultural well-being of sub-groups of the population (e.g., men, women, Indigenous, non-Indigenous).<br>Interactions with social and cultural well-being are not predicted during construction of the Replacement Activities. | N/A | None | N | None | N/A | N/A | N/A |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| Human Health or Aesthetics | N | • The Replacement Activities have limited interactions with water quality, air quality, and the acoustic environment, which are not predicted to cause changes that exceed regulated thresholds that could affect human health.<br>• See the Water Quality and Quantity, Air Emissions, and Acoustic Environment elements of this table for a description of interactions with air and noise emissions during construction of the Replacement Activities.<br>• There are no above-ground facilities required for the Replacement Activities.<br><br>Interactions with human health and aesthetics are not predicted during construction of the Replacement Activities. | N/A | None | N | None | N/A | N/A | N/A |
| Infrastructure and Services | N | • The Replacement Activities have a limited scope and relatively small workforce requirements (approximately 33 workers average; 45 workers at peak), and construction activities will be short-term in duration (approximately 5 months). No additional workers are required to operate the flowlines.<br>• The Replacement Activities are located on Goose and Bear islands, which are natural islands in the Mackenzie River adjacent to Norman Wells.<br>• Contractors will stay in existing local commercial accommodations (e.g., hotel, camp) during construction.<br>• Mobilization of vehicles and equipment to Norman Wells will occur in winter 2024-2025 along existing ice roads and existing barges in the summer months. Access to the disturbance footprint will occur in summer 2025 using a barge operated by Imperial; barge infrastructure at Norman Wells and Goose and Bear islands is existing.<br>• Existing infrastructure and services such as landfills for generated wastes, public roads, hotels, etc., are predicted to be sufficient to support the construction activities and workforce.<br>• It is unlikely that construction will disproportionately affect the availability of community services and infrastructure for subgroups of the population (e.g., men, women, Indigenous, non-Indigenous). | N/A | None | N | None | N/A | N/A | N/A |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| | | No interactions with infrastructure and services are predicted during construction of the Replacement Activities. | | | | | | | |
| Employment and Economy | N | • The Replacement Activities have a limited scope and relatively small workforce requirements (approximately 33 workers average; 45 workers at peak), and construction activities will be short-term in duration (approximately 5 months). No additional workers are required to operate the flowlines.<br>• Limited positive effects on employment and economy are predicted as a result of the Replacement Activities. Effects are not expected to be large enough to result in changes to local employment or economy.<br>• It is unlikely that the employment rate and income of sub-groups of the population (e.g., men, women, Indigenous, non-Indigenous) will change disproportionately as a result of the Replacement Activities. | N/A | None | N | None | N/A | N/A | N/A |
| Rights of Indigenous Peoples | N | This row consolidates assessment of effects on both Indigenous Traditional Land and Resource Use and Rights of Indigenous Peoples to reduce duplication of information.<br>• The Replacement Activities are located in the municipality of Norman Wells within the Sahtu Settlement Area. There are five communities in the Sahtu Settlement Area: Colville Lake, Déline, Fort Good Hope, Norman Wells, and Tulita,<br>• The Replacement Activities are located on Goose and Bear islands, which are natural islands in the Mackenzie River adjacent to Norman Wells. The islands are subject to seasonal flooding/ice scouring.<br>• The Replacement Activities are located on private lands in the Norman Wells Proven Area and adjacent to Imperial's existing NWO on the Mainland and Goose and Bear islands.<br>• On May 12, 2023, Imperial provided notification to those Indigenous groups identified as potentially affected by the Replacement Activities. Imperial attended community meetings in Norman Wells, Tulita, and Fort Good Hope in August and October, 2023. Community meetings in Colville Lake and Déline have not been confirmed; however, information regarding the Replacement Activities | N/A | None | N | None | N/A | N/A | N/A |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| | | were shared with leadership in these communities via email.<br>○ No concerns were raised with respect to the Replacement Activities during the community meeting in Norman Wells.<br>○ Community members in Tulita requested ongoing engagement from Imperial following regulatory approval and engineering design; Imperial commits to continued engagement with communities in the Sahtu Settlement Area regarding the Replacement Activities.<br>○ Community members in Fort Good Hope raised concerns related to potential for malfunction of the HDD (e.g., if the drill becomes stuck during construction of the trenchless watercourse crossing) and enquired about contingency plans. Imperial addressed concerns related to the malfunction scenario and provided information about the environmental setting, expertise of the Contractors, monitoring plans, and NWO emergency response plans.<br>○ To date, no concerns from leadership in Colville Lake and Déline have been raised with respect to the Replacement Activities.<br>• The disturbance footprint is approximately 3.58 hectares (ha) in area, including the entry side workspace on Bear Island and exit side workspace and HDD pullback on Goose Island. Of this, 1.81 ha occurs within previously disturbed areas used for Imperial's existing NWO and 1.77 ha is native vegetation. No new permanent disturbance is required. With the implementation of mitigation measures, minimal adverse residual effects of construction of the Replacement Activities on vegetation are anticipated to occur. Effects will be limited to the disturbance footprint for the duration of construction. Post-construction reclamation activities will be undertaken following construction.<br>• Mobilization of vehicles and equipment to Norman Wells will occur in winter 2024-2025 along existing ice roads and existing barges in the summer months. Access to the disturbance footprint will occur in summer 2025 using a barge operated by Imperial; barge infrastructure at Norman Wells and Goose and Bear islands is existing.<br>• The Replacement Activities will cross a channel of the Mackenzie River, which is a fish-bearing watercourse. The channel will be crossed via trenchless watercourse crossing method (i.e., HDD). | | | | | | | |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| | | This method does not involve direct disturbance to the bed or banks of or instream work within the Mackenzie River. HDD entry and exit workspace will be located outside the riparian area of the Mackenzie River. Therefore, the Replacement Activities are designed to avoid causing harmful alteration, disruption or destruction of fish habitat, as defined under the federal *Fisheries Act*. With the implementation of mitigation measures, residual effects of construction of the Replacement Activities on fish and fish habitat are not anticipated.<br>• Construction may result a small area of wildlife habitat alteration to accommodate TWS, and in sensory disturbance to wildlife, or accidental mortality through ground disturbance and vehicle collisions. Minimal adverse residual effects of construction of the Replacement Activities on wildlife and wildlife habitat are anticipated to occur. Effects will be short-term in duration (i.e., the construction period; approximately 5 months). Post-construction reclamation activities will be undertaken following construction.<br>• Effects associated with construction noise, vehicle and equipment use, and associated air emissions may affect the area immediately surrounding the Replacement Activities. The only sources of air emissions are vehicles and equipment during construction. These emissions will be limited, short-term and transient. Any change in noise levels will be limited and short-term. Noise and air emissions from construction equipment will be addressed through the use of codified practices, proven effective mitigation measures, and best management practices.<br>• The Replacement Activities have a limited scope and relatively small workforce requirements (approximately 33 workers average; 45 workers at peak), and construction activities will be short-term in duration (approximately 5 months). No additional workers are required to operate the Replacement Activities. Contractors will stay in existing local commercial accommodations (e.g., hotel, camp) during construction. It is unlikely that the construction workforce will disproportionately affect the socio-economic conditions or availability of community services and infrastructure for sub-groups of the population (i.e., men, women, Indigenous, non-Indigenous).<br>• To date, concerns raised by potentially affected Indigenous groups with respect to the Replacement Activities include request for ongoing engagement | | | | | | | |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |
| | | and malfunction scenarios. Imperial commits to continued engagement with communities in the Sahtu Settlement Area regarding the Replacement Activities. Imperial will implement prevention, mitigation, and response measures outlined in the EPP to address accident and malfunctions scenarios. Potential accident and malfunction scenarios are discussed under the Accidents and Malfunctions element in this table.<br>• Imperial will continue to engage with Indigenous groups and other stakeholders in the area surrounding NWO and the Replacement Activities.<br>• Imperial plans to engage Indigenous personnel as appropriate for field activities associated with the Replacement Activities.<br>Interactions with traditional land and resource use and the exercise of rights of Indigenous people (e.g., hunting, trapping, fishing, gathering and undertaking other cultural pursuits) are not predicted during construction. | | | | | | | |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

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|---|---|---|---|---|---|---|---|---|---|
| Accidents and Malfunctions | Y | The following potential accident or malfunction scenarios were considered in this assessment:<br>• hazardous materials release<br>• fire<br>• drilling fluid release (i.e., frac-out) | Complete | • A hazardous materials release could occur during construction due to improper handling, use or storage.<br>• Fire could occur during construction due to explosion, lightning or other natural events.<br>• Alteration to terrestrial and aquatic resources could occur as a result of inadvertent drilling mud release during flowline construction. | Y | **Hazardous Materials Release**<br>• Maintain an emergency spill response kit at the worksite wherever equipment is staged or fuel is stored.<br>• In the event of a spill implement the Spill Release Contingency Plan (EPP Appendix B).<br>• Notify the Construction Manager and Environmental Inspector as soon as possible following the discovery of any spill.<br>• The Environmental Inspector will immediately report any spill exceeding reportable quantities as detailed to the Government of the Northwest Territories (GNWT) spill report line as detailed in the Spill Release Contingency Plan (Appendix B).<br>• Other responsibilities for the Environmental Inspector include:<br>  ○ reporting any spills in accordance with federal and territorial reporting and notification protocols and advising Imperial management on the clean-up and disposal of the material and any affected soils or vegetation<br>**Fire**<br>• Personnel must be made aware of proper disposal methods for welding rods, cigarette butts and other hot or burning material.<br>• Smoke only in designated areas.<br>• Maintain appropriate emergency fire suppressant equipment onsite.<br>**Drilling Fluid Release**<br>• Drilling fluid additives will be selected to comply with applicable regulatory approvals.<br>• The Contractor will keep a record or log of the drilling fluid additives used during the course of drilling activities and submit it to the Environmental Inspector prior to removing the drilling rig from site.<br>• Any drilling additives not included in the original scope of the Replacement Activities will be assessed and approved prior to use.<br>• Contain all drilling water and drilling waste for reuse or disposal.<br>• Water will be withdrawn from the Mackenzie River to mix drilling fluid. | With the implementation of prevention, mitigation and response measures, accidents and malfunctions are not likely to occur. If they occur, adverse residual effects are predicted to be negligible provided emergency response measures are implemented. | A cumulative effects assessment of accidents and malfunction scenarios is not warranted. | Monitoring and inspection will occur during construction. |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

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|---|---|---|---|---|---|---|---|---|---|
| | | | | | | The mud mix should be bentonite-based with no unapproved additives.<br>• Water withdrawals must not exceed the limits in applicable water licenses.<br>• Notify the Environmental Inspector and Construction Manager as soon as possible following an exceedance of specified turbidity levels.<br>• Follow the Inadvertent Fluid Release Contingency Plan (Appendix B) in the event of an observed or suspected return of drilling fluid to surface or to a waterbody.<br>• The Drilling Contractor shall monitor the volume, pressure and parameters of drilling fluid to detect any losses during drilling operations.<br>• If an inadvertent return of drilling fluid is identified offsite, cleanup procedures will be developed in consultation with the Imperial Environment and Regulatory Advisor and Environmental Inspector. | | | |

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
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| Effects of the Environment on the Project | Y | Interactions could occur due to severe weather events or wildfires. | Complete | Effects may arise during construction due to:<br>• Weather<br>  ○ Extreme temperatures<br>  ○ Heavy precipitation and flooding<br>  ○ Heavy snow and ice events<br>  ○ Lightning<br>  ○ High Winds<br>• Wildfires | Y | • The Environmental Inspector will monitor soil stockpiles for erosion by wind. In the event of wind erosion, implement the following mitigation measures as warranted:<br>  ○ suspend construction activities until high winds subside<br>  ○ apply water to the topsoil pile<br>  ○ lightly compact sandy or pulverized soils<br>  ○ install wind fences<br>• Where construction during adverse weather conditions have the potential to result in wind/water erosion, excessive rutting, decreased soil capability or the potential for serious harm to fish and fish habitat, temporary shutdowns may be necessary. Temporary shutdowns will be based upon discussions between the Construction Manager, Contractor and Imperial Environment and Regulatory Advisor or Environmental Inspector. The Construction Manager must authorize resumption of work in consultation with the Imperial Environment and Regulatory Advisor or the Environmental Inspector prior to restart.<br>• Replace topsoil as evenly as possible over areas where topsoil was salvaged. Postpone topsoil replacement during wet weather or high winds to limit potential damage to soil structure or erosion of topsoil. | With the implementation of mitigation, preventative and response measures, residual adverse effects of the environment on the Replacement Activities are not anticipated. | None | Monitoring and inspection will occur during construction. |

NOTES:

Imperial confirms that all the standard environmental mitigation noted in the above table as well as the following contingency plans and management plans are included in an Environmental Protection Plan (EPP) for the Replacement Activities: Spill Release Contingency Plan; Inadvertent Fluid Release Contingency Plan.

**Interactions Table:** Norman Wells Goose to Bear Island Flowline Replacement

| A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|
| **Element** | **Interaction (Y/N)** | **Description of Interaction(s) (If no interaction is predicted, provide a justification)** | **Status of Element-specific study or survey (complete, underway, date expected, or N/A)** | **Description of Potential Effects** | **Mitigation will be implemented to resolve potential adverse effect (Y/N)** | **Specify the Mitigation** | **Description of Residual Effects after Mitigation** | **Description of the Cumulative Effects** | **Monitoring Plan/Details** |


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